

Grand Canyon National Park



Natural History Lesson Plans

Table of Contents

Creating a Cover	NH-2
Do You See What I See? ...	NH-5
Canyon Critters	NH-7
Ecosystem Scrambler	NH-11

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Creating a Cover

School Subjects	Science; Art
Grade Level	3 - 5
AZ Standards Addressed	Science SC03 -S1C4-01/03; -S4C1-01/02; -S4C3-03 SC04 -S4C1-01/02; -S1C1-04; -S1C4-01/03 SC05 -S1C1-03; S1C4-01/03 Art 1AV-F1 P01/03; 1AV-F2 P03; 1AV-F3 P01

Lesson Overview

Students create their own cover for the journal they will complete during the "Life on the Edge" program. The cover can include a collage of photos and/or drawings of plants and animals that live in the students' hometown and at Grand Canyon. (If your class is not coming to Grand Canyon but you need them to make a journal for other purposes, you can modify this activity to meet your needs.)

Lesson Objectives

Students will:

- Be able to identify several animals and plants that live in different ecosystems.
- Gain an understanding of the diversity of plants and animals that survive in different environments.
- Be introduced to the idea of a journal as a tool for studying Grand Canyon.
- Understand how a creative and personal approach to their journal will increase their memory and understanding of Grand Canyon.

Materials

- Construction paper (various colors may be used; size can be 8 $\frac{1}{2}$ x 11 or 9 x 12)
- Journal insert included with this activity (make enough copies so each student will have one)
- Magazines, brochures, or other media with photos of wildlife and plants from near your hometown and/or from Grand Canyon (for a listing of Grand Canyon animals see the activity "Canyon Critters").
- Scissors
- Glue
- Colored pencils, crayons, or markers
- Staples and stapler
- Optional: reference books on animals, encyclopedias, field guides, etc.

Background Information

Arizona has a wide diversity of ecosystems ranging from hot deserts to alpine tundra. Therefore, there is also an amazing diversity of plants and animals that call Arizona home. If you are not familiar with all the variety that Arizona has to offer, local natural history museums and botanical gardens offer an abundance of information. Some may have free information that can be sent or they may have websites available so you can gather information from the classroom.

In addition, numerous magazines specific to Arizona (ie. Arizona Highways) offer many photos and information about state-wide flora and fauna. Each National Park Service site in Arizona (there are 20!) will have information on flora and fauna found in the park area.

Procedure

1. Prior to conducting the activity, begin collecting magazines, brochures and other printed media with photos of animals and plants that both live in your area and at Grand Canyon (for Grand Canyon animal photos see the activity titled "Ecosystem Scrambler". These can be printed out on a black-and-white or color printer if available.). You can also have students start bringing some of these items in from home, too.
 2. Tell the students that they will be making the front and back covers of a journal they will use during their field trip to Grand Canyon (if your class is not coming to Grand Canyon, but you want them to make a journal for a different activity or field trip, you may modify this activity as needed). Discuss the value of journals; in addition to recording observations, feelings and impressions, they are places to record important data to refer to later. Both words and artwork can be important ways to record all these things; and both recording methods will be used in the "Life on the Edge" journal.
 3. Have the students identify at least one animal and one plant that lives in the part of the state they live in, and one of each that lives at Grand Canyon.
 3. Hand out the construction paper - if you have a variety of colors, they can come up and choose which color they want. Have students fold the construction paper in half. Get out colored pencils, crayons, marking pens, or the like. Also get out the scissors, glue, tape and stapler.
 4. If you have collected a lot of animal and plant photos*, have the students cut out at least one of each that live at Grand Canyon. Have them glue them to what will be the front cover of their journal. They can label each if they want. Make sure they leave room to put their own name on the cover, too.
- *if you don't have enough photos, they can also draw the plant(s) and animal(s).
5. Now have students cut out one of each plant and animal that they think they would find in the area they (the students) live in. Have them glue these on what will be the back cover and label them if they want.
 6. Take the journal insert and have the students staple it into their journal such that their artwork forms the outside front and back covers of their journal.
 7. Discuss why they think that different animals, or possibly the same animals, live at Grand Canyon as opposed to where the students live. Is one area hotter? Wetter? Higher elevation? Etc.

Extension Activity

On the inside of the front and back covers, have them write something down about the plants and animals they chose. This could include an adaptation each has to living where it lives, or perhaps some information on the range of each species - is it specific to one area or does it live in many places. They could even write a poem, haiku or other such creative writing about their plant or animal.

One option is the following type of poem, called a "cinquain", which uses this format:

Line 1: one word to name the subject (noun)
Line 2: two words to describe it (adjective)
Line 3: three words of action about it (verbs)
Line 4: four-word phrase about it
Line 5: one new word that names the subject (noun)

EXAMPLE
canyon
huge, colorful
eroding, growing, changing
making me feel small
chasm

Resources

The following organizations have websites with information that may be useful:

Arizona Game and Fish Department

- www.gf.state.az.us/i_e/environmental_education.html
- www.azgfd.com

National Park Service and US Fish and Wildlife Service

- www.nps.gov/grca/pphtml/nature.html (Grand Canyon specific)
- www.nps.gov (will enable you to see an alphabetical listing of parks)
- www.fws.gov
- <http://educators.fws.gov>

Environmental Education Sites

- www.arizonaee.org
- www.eelink.net/classroomresources-directories.html
- www.ag.arizona.edu/extension/plt
- www.azresourceed.org

Science Teacher Association Sites

- www.nsta.org
- www.azsta.org

Do You See What I See?

School Subjects	Language Arts, Science, Art
Grade Level	K - 8
AZ Standards Addressed	Science SC03 -S4C3-01/02; -S1C3 01 SC06-S1C2-05 Art 1AV-F1 P01/03; 1AV-F2 P03; 1AV-F3 P01

Lesson Overview

Students will practice observing their surroundings and recording what they see through words and/or drawings. They will list what they remember seeing in an environment (ie. On part of a wall in the classroom that has been covered; what is on the playground outside; etc), then check their accuracy and discuss the results. They will then apply these skills in another setting.

Lesson Objectives

Students will:

- Be able to describe differences between their memories of a scene and their observations of the same scene.
- Be able to describe why it is important to carefully observe something, and to record the information if they are to accurately remember it or pass the information on to others.

Materials

- A cloth sheet or large piece of paper
- Journal, note pad or sheet of paper for each student

Procedure

1. Before students arrive at class cover a section of a wall, chalk board or a desk with the cloth sheet or large pieces of paper. Use a surface that the students likely see on a regular basis and therefore have some familiarity with. When the students arrive have them write down or draw what they think is on the surface that has been covered. After they have done this, remove the covering and have them see what they included and what they missed. Some questions to consider:

- Are there any patterns overall of what was remembered or not remembered?
- Did all students remember certain items? Did all miss certain items? Was it more random?
- Why did they remember or not remember certain items?
 - Camouflaged? A bright or dull color?
 - Not of interest to them?
 - Something they like or dislike?

2. Now have them write down or draw as many details as possible about an outdoor area around the school (ie. Playground, playing field, etc). This can include not only physical items like play equipment, trees, fences, etc., but you can also have them include any sounds they may recall hearing on a regular basis (ie. A nearby highway or railroad, the school bell, birds, etc), or any smells that are common (ie. Fresh cut grass, lunch being cooked in the cafeteria, etc.) After they do this, take the class outdoors to the area and again have them compare what they remembered relative to what is actually there.

3. Have the students pick a spot to sit outdoors. Each student should have space from the others by sitting at least 10 feet apart, and they should be quiet (no talking or excessive shuffling of feet, legs, etc.). Have them record in as much detail all that they see, hear, feel and smell. They can choose to focus on a small area (ie. One tree or rock) or on the whole scene. Give them a minimum of five minutes to complete the exercise.

Ideas to enhance the students' senses: Cupping their hands around their ears simulates the large ears of deer, elk and other animals, and increases their ability to hear subtle sounds. Moistening the undersurface of the nose and the entire upper lip increases the sense of smell (many animals can do this to help them smell for predators or prey).

4. Discuss the joy and importance of closely observing the world around them. Through this process, they learn to appreciate, respect and understand more about the world in which we live. It is through this process of observing and recording that we understand the role of all the plants and animals that live in the deserts, mountains and other regions of the world. In addition, they begin to appreciate and understand the fundamental life support systems we all rely on - air, water, soil, plants and animals.
5. If your class will be participating in one of our natural history programs, Life on the Edge or Discovery Pack, you may want to discuss with them that their powers of observation will be used extensively while exploring the forested rim of Grand Canyon. In addition, like any scientist doing field work, they will be recording their observations in journal.

Extension Activities

1. If you have access to a park or wild area near your school, they can be excellent locations for this activity.
2. Find and observe an insect or small animal if available. Pretend you are making a report to a scientist because what you are observing has never been seen before. Provide a detailed description. If you were reporting your find to the general public, would you change what you say about the creature regarding details?

Canyon Critters

School Subjects:	Science
Grade Level:	3 - 6
AZ Standards Addressed:	SC03 -S1C2-03/05; -S1C3-02; -S1C4-01/03; -S4C1-01/02; -S4C3-03 SC04 -S1C2-05; -S1C3-01; -S4C1-01/02; -S1C1-04; -S1C4-01/03 SC05 -S1C1-03; S1C4-01/03

Lesson Overview

Students will study animals that call Grand Canyon home and will develop an appreciation for the diversity of life within the park. This lesson is designed to be flexible to meet teacher and student needs, and can be made as easy or difficult as desired. For students coming on a field trip to Grand Canyon, this lesson helps them understand the fascinating variety of wildlife at the canyon and provides knowledge that they will have an opportunity to apply to the activities during their ranger-led program.

Lesson Objectives

Students will be able to:

- Name at least 10 animals that call Grand Canyon home
- Answer questions about their selected animal regarding feeding habits, habitats, interactions with other organisms, and physical description.
- Draw connections between Grand Canyon and their home environment
- Demonstrate research skills and organization

Materials

Access to a library with resources about Arizona fauna (books, magazines, internet, reference books)

Background Information

Grand Canyon is home to an astonishing array of wildlife. Over 450 types of mammals, reptiles, amphibians, birds, and fish live within the 1.2 million acres of the park. The reason for this vast diversity of life stems from the fact that Grand Canyon topography is quite varied—from over 8000 feet elevation on the North Rim to around 2000 feet at the bottom of the canyon. These changes in elevation result in drastic climatic differences, creating environments that range from alpine forests on the rim to Sonoran desert at the bottom (as you go up in elevation temperatures go down about 4°F every 1,000 feet). In addition, riparian areas—environments next to water sources—provide habitats for a great number of plants and animals that would otherwise be unable to survive in a dry landscape (The Colorado River, and numerous springs and small side streams provide this habitat in the canyon). These riparian areas comprise a very small percentage of the Grand Canyon landscape, but provide critical habitat for many different organisms.

This diversity of life within Grand Canyon National Park contributes to the park's uniqueness and importance. National Park status ensures that these plants and animals, some of which only live at Grand Canyon, are protected from human interference.

A list of common animals and where they reside in the park:

Common Name	Scientific Name	Where at Grand Canyon?
<i>Mammals</i>		
Abert's squirrel	Sciurus aberti	Forest on the South rim
Beaver	Castor canadensis	Colorado river
Black-tailed jackrabbit	Lepus californicus	All environments
Bobcat	Felis rufus	All environments
Common porcupine	Erethizon dorsatum	Forest on the rims
Coyote	Canis latrans	All environments
Deer mouse	Peromyscus maniculatus	Forest on the rims
Desert bighorn sheep	Ovis Canadensis	Mostly inner canyon
Desert cottontail	Sylvilagus audubonii	All environments
Kaibab squirrel	Sciurus kaibabensis	Forest on the North rim
Mountain lion	Felis concolor	All environments
Mule deer	Odocoileus hemionus	All environments
Ringtail	Bassariscus astutus	Riparian areas
Rock squirrel	Spermophilus variegatus	All environments
Rocky Mountain Elk	Cervus elaphus	Forest on the rims
Striped skunk	Memphitis memphitis	Forest on the rims
Western pipistrelle bat	Pipistrellus hesperus	All environments
Western spotted skunk	Spilogale gracilis	Riparian areas
<i>Birds</i>		
Bald eagle	Haliaeetus leucocephalus	Colorado river
California condor	Gymnogyps californianus	All environments
Common merganser	Mergus merganser	Colorado river
Common raven	Corvus corax	All environments
Great blue heron	Ardea herodias	Colorado river
Great horned owl	Bubo virginianus	Forest on the rims
Peregrine falcon	Falco peregrinus	All environments
Red-tailed hawk	Buteo jamaicensis	All environments
Steller's jay	Cyanocitta stelleri	Forest on the rims
Turkey vulture	Cathartes aura	All environments
Western bluebird	Sialia mexicana	Forest on the rims
Western scrub jay	Aphelocoma californica	Forest on the rims
<i>Reptiles and amphibians</i>		
Short-horned lizard	Phrynosoma douglassii	All environments
Collared lizard	Crotaphytus collaris	Inner canyon desert
Grand Canyon pink rattlesnake	Crotalus viridis abyssus	Inner canyon desert
Canyon tree frog	Hyla arenicolor	Riparian areas
Desert tortoise	Gopherus agassizii	Inner canyon desert
<i>Others</i>		
Desert tarantula	Aphonopelma chalcodes	All environments
Bark scorpion	Centruroides exilicauda	Inner canyon desert
Humpback chub	Gila cypha	Colorado river

Procedure

1. Assign an animal to each student or group of students. Depending on the age and ability levels of your students, you can make this project as simple or in-depth as you desire. The animals you assign to students should be based upon interest and available local resources. It is best to check with your school librarian to determine the amount of information about each organism that your students will have access to. Some animals may be much easier to research than others.

Have them research their animal by answering some or all of the following questions:

- a) Describe your animal so that a friend would be able to identify it without ever seeing it before.
- b) What does your animal eat?
- c) What animals prey upon (eat) your animal?
- d) What type of habitat does your animal prefer (dry desert, pine forests, etc.)?
- e) What time of day is your animal active (night, day, dawn and dusk)?
- f) What are two interesting facts about your animal?
- g) Does this animal live where you live? Why or why not?

2. In addition to answering questions about their animals, you may wish to have students complete one or some of the following:

- Posters
- Presentations
- Dioramas
- Sculptures
- Computer-related projects

3. Pick different parts of the room to be different habitats and have the students put their animal in the habitat they think or know it should be in. This can also be done on a wall to show the vertical differences in habitats at Grand Canyon with the desert and riparian habitats being down near the floor and the cooler forest habitats being higher on the wall.

Extension Activity

One of the most important facets of ecology is learning how all organisms are connected within their environments. An ecosystem includes carnivores (meat eaters), herbivores (plant eaters), omnivores (meat and plant eaters), scavengers (clean-up crew), decomposers, plants, fungi, water, air, soil, and sunlight.

When students have finished learning about their animals, see if they can create a food web by drawing connections between their animals. Challenge students to find who they are connected to within the class. Does every animal have some sort of connection? If not, what is missing? What would happen if one of the animals was taken away? Why is it important for a balance of different organisms to be present in an ecosystem?

Ecosystem Scrambler

School Subjects:	Science
Grade Level	3 - 6
AZ Standards Addressed	SC03 -S1C2-03/05; -S1C3-02; -S1C4-01/03; -S4C1-01/02; -S4C3-03 SC04 -S1C2-05; -S1C3-01; -S4C1-01/02; -S1C1-04; -S1C4-01/03 SC05 -S1C1-03; S1C4-01/03

Lesson Overview

Students will use clues about Grand Canyon plant and animal adaptations to identify the ecosystem in which each organism resides.

Lesson Objectives

Students will be able to:

- Use clues to place animals and plants in correct environments: desert, forest, and riparian
- Identify specific plants and animals that live at Grand Canyon
- Explain how the topography of Grand Canyon affects climate and ecosystems

Materials

- Ecosystem scrambler cards and animal photos (photocopy and cut one set per group—see below)
- One large piece of paper per group, with a simple cross-section of Grand Canyon (see example below)

Background Information

Grand Canyon is home to an astonishing array of wildlife. Over 450 types of mammals, reptiles, amphibians, birds, and fish, and over 1600 different types of plants live within the 1.2 million acres of the park. The reason for this vast diversity of life stems from the fact that Grand Canyon topography is quite varied—from over 8000 feet elevation on the North Rim to around 2000 feet at the bottom of the canyon. These changes in elevation result in drastic climatic differences, creating environments that range from alpine forests to Sonoran desert. In addition, riparian areas—environments next to water sources—provide habitats for a great number of plants and animals that would otherwise be unable to survive in a dry landscape. These riparian areas comprise a very small percentage of the Grand Canyon landscape, but provide critical habitat for many different organisms.

As a result of these varied ecosystems, many plants and animals at Grand Canyon exhibit *adaptations* that allow them to live in each environment. An adaptation is defined as any behavior or physical quality that provides an organism with an enhanced ability to survive in a particular environment. For instance, polar bears have extremely thick fur that enables them to withstand freezing temperatures above the Arctic Circle. This activity explores some adaptations of common Grand Canyon plants and animals and how they relate to the specific ecosystem in which each animal lives.

Procedure

Before beginning the activity: Print out animal name/adaptation cards and photos below (the photos will print out fairly well in black-and-white if you do not have a color printer. **Note:** when both 8 $\frac{1}{2}$ x

11 sheets are printed out and placed back-to-back, the photos and animal name/adaptations will match up). You can glue the photos to the back of the adaptation cards ahead of time and cut them up. Or, cut the cards and photos apart without gluing them and give each group either an adaptation or animal card and have them find the right matching card as part of #2 below. They can then glue them back-to-back.

1. Introduce the concept of adaptations to your students. Challenge them to come up with adaptations of common animals that live in different environments. Examples: polar bears have thick fur for warmth, fish have fins for swimming, giraffes have long necks for reaching tall trees.
2. Create groups of 2-4 students each and give each group a set of ecosystem scrambler cards, along with the simple line drawing of the Grand Canyon.
3. Challenge students to use the clues on the backs of the cards to place them in the right location on the Grand Canyon drawing: forest on the rim, inner canyon desert, or riparian areas near water sources. (answer key below)
4. Check student work as they progress, encouraging them to color the background of their Grand Canyon scene.
5. Discuss the students' solutions and why they made the choices they did. Display the scenes in your classroom. In addition, or as an alternative, you can draw a large cross-section of Grand Canyon on the board and have each group put their animals in what they think is the appropriate place on the cross-section.

Answer Key:

Inner Canyon Desert-

Bighorn sheep: I can survive for several days without drinking water.

Tortoise: I can make burrows underground that have much lower temperatures than the outside air.

Grand Canyon pink rattlesnake: I am colored pink so that I match the Grand Canyon rocks.

Collared lizard: I cannot survive in cold weather.

Barrel cactus: My fleshy stems help me to save water.

Agave plant: My leaves help to funnel rainwater to my roots.

Riparian-

Great blue heron: Fish are my favorite food.

Beaver: My feet are webbed.

Canyon Tree Frog: My eggs need to hatch in water.

Humpback chub: I am a fish!

Cottonwood tree: I can grow very tall because I have plenty of water.

Cattail: I love to grow in very muddy places.

Forest on the Rim-

Porcupine: I love to eat tree bark.

Squirrel: I have long toes and claws for climbing trees.

Elk: I have thick fur to survive cold winters.

Scrub jay: I often hide pine seeds so I can eat them later.

Ponderosa pine tree: My branches can bend so they won't break when snow piles on them.

Gambel oak tree: I lose my leaves in the fall when the weather gets colder.

<p>Tortoise</p> <p>I can make burrows underground that have much cooler temperatures than the outside air.</p>	<p>Collared Lizard</p> <p>I cannot survive in cold weather.</p>	<p>Great Blue Heron</p> <p>Fish are my favorite food.</p>
<p>Scrub Jay</p> <p>I often hide pine seeds in the ground so I can eat them later.</p>	<p>Porcupine</p> <p>I love to eat tree bark.</p>	<p>Grand Canyon Pink Rattlesnake</p> <p>I am colored pink to match Grand Canyon rocks.</p>
<p>Humpback Chub</p> <p>I am a fish!</p>	<p>Canyon Tree Frog</p> <p>My eggs need to hatch in water.</p>	<p>Bighorn Sheep</p> <p>I can survive for several days without drinking water.</p>
<p>Barrel Cactus</p> <p>My fleshy stem helps me to save water.</p>	<p>Ponderosa Pine Tree</p> <p>My branches can bend so they won't break when snow piles on them.</p>	<p>Tassel-eared Squirrel</p> <p>I have long toes and claws for climbing trees.</p>
<p>Cattail</p> <p>I love to grow in muddy areas.</p>	<p>Gambel Oak Tree</p> <p>I lose my leaves in the fall when it starts to get cold outside.</p>	<p>Elk</p> <p>I have a thick coat of fur to survive cold winters.</p>
<p>Cottonwood Tree</p> <p>I can grow very fast so I am big enough to survive flash floods.</p>	<p>Agave</p> <p>My leaves funnel rainwater to my roots so that I have enough to drink.</p>	<p>Beaver</p> <p>I have webbed feet.</p>

